

[By way of comment on the above, Dr. C. Brooke Worth quotes from Craig and Faust, 'Clinical Parasitology', Philadelphia, 1940, the following:

P. 493. 'Leeches are hermaphroditic. Each worm possesses 1 to 10 or more pairs of small, hollow, spherical testes. A small vas efferens, arising from each testis, enters one of the paired vasa deferentia, which continue as paired seminal vesicles, each being usually provided with a prostate gland, an ejaculatory duct and a muscular penis. The two ejaculatory ducts enter a common bursa copulatrix or genital atrium. The ovaries consist of a single pair of coiled, filamentous sacs which are continuous with their ducts. The two ducts unite to form a common convoluted oviduct, which is continued as a muscular uterus and opens through a short vaginal tube in a mid-ventral line, one metamere behind the male genital opening (usually stated to open on somite 9).'

P. 494. 'In some leeches insemination is accomplished when one leech implants onto the cuticula of another a horny pocket or spermatophore, from which spermatozoa issue forth, migrate through the tissues of the recipient and reach its ovary. In the group to which the medicinal leech (*Hirudo medicinalis*) belongs, reciprocal copulation takes place by the introduction of the penis of each into the vagina of the other and the reciprocal deposition of a spermatophore. Thus, in either type, fertilization takes place before the eggs are laid.'

He agrees that Mr. Leslie's observation is of interest, for the witnessing of mating behaviour of leeches must be a rare, if not unique, occurrence. One is tempted to guess that the leeches' antics served as recognition signals to bring them together for copulation.—EDS.]

### 23. DESCRIPTION AND DISCUSSION OF THE BITING OF AN INDIAN LAND LEECH (ANNELIDA; HIRUDINEA)

In the literature at hand embracing medical parasitology there is no detailed description of a land leech's biting. Hence it may be of interest to record experience arising out of curiosity about this matter.

Craig and Faust (1) give information that indicates *Haemadipsa zeylanica* as the common land leech of Southern India. Leeches corresponding in size (about 1 inch long) and somewhat in behaviour to this species are common on coffee and cardamom plantations in the western part of Mysore State, especially in the monsoon period during the summer months. The present observations were made near Sakleshpur, Hassan District, in the Western Ghats during June-August, 1951.

A word should be said first about the method by which these leeches reach a host. In Craig and Faust and in Manson-Bahr (2) is found the statement that terrestrial leeches 'actively spring' upon their victims, while Strong (3) recounts the opinion that *H. zeylanica* may at times 'drop' onto hosts from overhanging vegetation. While neither of these methods of attack has been observed in Mysore, the second can be imagined as possible, but the first cannot be classified as otherwise than fantastic. Leeches have light receptors but no visual organs,

for registering images, so that the presence of a potential host in their vicinity could be realised by them only as a vague phenomenon. Leaping, if it took place, would be random and ridiculous. Secondly one wonders just how a leech would manage a leap, since its locomotor organs consist solely of the anterior and posterior suckers, structures that are hardly adapted for jumping.

Dropping onto a victim entails the necessity again for accurate awareness of the position of a passing host. Perhaps the jostling of vegetation would provide sufficient stimulus to spark the dropping manoeuvre. But so far as Mysore observations are concerned, the unfed leech is loth to detach itself from whatever substrate supports it. Locomotion, even by the hungriest leech, is accomplished by a succession of looping motions, resembling those of a measuring worm (Lepidoptera; Geometridae). The hind part of the body is brought forward when the anterior-sucker has found agreeable attachment; the fore part is extended when the posterior sucker is similarly satisfied. Thus final lodgement on a host results from initial awareness of the host's presence and resultant crawling activity in the host's direction. The fact that coffee planters and other bucolic inhabitants have a motto, 'Walk first in line,' is a testimonial not to leaping or dropping of leeches, but to leeches' awakened activity when the first man passes, leading to infestation of individuals subsequently traversing the disturbed path.

Land leeches may be encountered or collected when one walks through damp ravines or similar moist situations. They frequently are detected first on one's shoes. If it is desired not to permit them to feed, one naturally tries to remove them and throw them away. This is about as easy as trying to rid one's fingers of a wad of chewing gum that has begun to stick. The leech's leathery or rubbery integument seems almost insusceptible of injury, and even rough treatment, from hand to hand, does not dissuade the worm from fastening itself by one sucker or both to each new grasping forefinger and thumb.

The leech on a shoe, or on a stone or rotted leaf near its prospective host, progresses by a series of looping motions. Each time the posterior sucker is brought forward to a new position, the anterior part of the body is elevated and goes through a rapid vibratory groping motion which could be likened to the sniffing of a dog determining the direction of its quarry. Whether this is a search merely on a tactile basis, or an actual olfactory experience, cannot be assessed.

When a leech is placed purposely on the back of one's hand, in order to observe it conveniently through a lens, it quickly avails itself of the opportunity to feed without disturbance. The anterior sucker is apparently some sort of testing or tasting mechanism, for the leech is not always satisfied with the first spot encountered. However, one or two looping steps usually suffice to bring the animal into feeding frame of mind.

Immediately when the leech finds a location suitable for feeding, the human subject may feel a slight stinging or irritating sensation. This lasts for half a minute or less; were the observer engaged in other activities, the chances are that nothing at all would be noticed.

But even the intent student feels nothing more after this short initial period of minimal discomfort.

Close examination of the leech from now onward discloses that its neck is the site of rhythmic contractions and expansions. These movements consist of slight alternating dimplings of the cuticle in two regions, one behind the other. A low-powered hand lens provides sufficient magnification for observing this phenomenon. The frequency of contraction cycles is about two or three per second.

During the first five minutes there is little change in the general situation. The leech appears to draw its posterior sucker slightly forward, but this may in reality be illusion produced by its imperceptibly broadened diameter as the first blood is ingested.

For the next fifteen minutes the events attendant upon beginnings of obvious engorgement take place. Sucking motions of the neck region continue without interruption. The body becomes distended laterally and dorsoventrally. A pool of thin liquid—not mucus—begins to appear around the leech. The nature of this liquid has not been studied in Mysore. However, it appears in increasingly copious amounts during the remainder of the feeding period, and the possibility suggests itself that the transudation or excretion may be a means of getting rid immediately of excess fluid from ingested blood, in order to concentrate the solid elements of that tissue. This would increase the efficiency of feeding and the subsequent possibilities for massive egg production.

In the following twenty minutes maximum engorgement takes place. Owing to the attachment of the posterior sucker in a fixed position, the body of the leech is pushed forward over its head, leading to an undershot position of the anterior sucker, and the bending of the leech's neck into S-shaped curve. The distortion becomes increasingly marked as feeding progresses to its completion.

When engorgement becomes advanced, a series of irregular peristaltic contractions of the body begins, the waves of contraction moving in general from before backwards, although being by no means uniform. This must serve to put the ingested blood through a churning action, and also to distend the paired lateral pouches of the crop in which food is stored, thereby possibly making room for the imbibing of more nutriment.

Just before voluntary detachment, the leech exhibits maximal peristaltic activity, while the surrounding pool of 'leech fluid' becomes also most voluminous. Detachment takes place during an exhibition of peristalsis, as if the worm were still reluctant to let go, but in its bloated and unwieldy condition were unbalanced by the violence of its somatic activities.

The site of attachment, viewed through a lens and through 'leech fluid' at the instant of release, resembles a geometric three-cornered star, aptly described as a triradiate wound (1). The cut edges are wonderfully neat and symmetrical. Owing to prolonged sucking action of the leech, the edges are now slightly edematous and therefore elevated, with separation of apposite margins.

Blood immediately diffuses into the leech fluid. However, the present observer experienced only slight subsequent bleeding. After wounds were wiped once or twice with a handkerchief, clotting took place and

an insulating crust was formed. This is not in accord with most reports, in which the lesions are said to bleed 'for sometime' even after voluntary detachment of the leeches (3).

Later reactions to leech bites in the present instance have consisted of: (a) Visualisation of the triradiate lesion (under magnification) for eight hours following the bite. Hemorrhagic infiltration of the surrounding skin was evident within the edematous area corresponding to diameter of the leech's mouthparts (under 2 mm.). (b) Itching of the bite site was noted for several days.

The engorged leech, on relinquishing its hold, encounters difficulties in locomotion, since it is now so greatly distended. It shows no hesitation in dropping to the ground, which must be a rather uncomfortable experience for a worm with a full stomach. Upon reaching such environment, it continually falls over to right or left, since its pot belly interferes with easy progress. The anterior end apparently still functions as a sense receptor, apprising the organism of the state of local conditions. Thus the leech succeeds at last in dragging itself to the edge of a pebble, beneath which it secretes itself within a few moments.

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#### REFERENCES

1. Craig, C. F., and Faust, E. C. (1940): Clinical Parasitology, Lea and Febiger, Philadelphia.
2. Manson-Bahr, P. H. (1929): Manson's Tropical Diseases, Ninth Edition. William Wood and Co., New York.
3. Strong, R. P. (1944): Stitt's Diagnosis, Prevention and Treatment of Tropical Diseases. The Blakiston Company, Philadelphia.

#### 24. A TERATOSIS OF *MUSSAENDA HIRSUTISSIMA* HUTCH

A striking teratosis of *Mussaenda hirsutissima* has been found in the High Range of Travancore which seems worthy of record.

The species is common in the area and is very conspicuous on account of its bright orange red flowers and the occurrence of a greatly enlarged sepal on some of the flowers which is white in colour and roughly of same size as the leaves. The enlarged sepal is by no means regularly formed. In a series of inflorescences of from 8-21 flowers, not more than 3 or 4 show this development in each inflorescence.

In the abnormal plant, the frequency of the enlarged sepal is similar to that in the normal type, but every corolla is replaced by 5 separate 'petals' of the same form and colour as the enlarged sepal. The stamens are represented by short hairy subulate staminodes. The ovary is 5-locular, instead of the normal bilocular, and the usual single style with a bilobed stigma is replaced by 5 separate style-like organs considerably shorter than the normal style, which do not appear to have functional stigmas.

Two plants of this type have been found both within a few yards of each other, but separated by a metalled road, in association with a number of quite normal individuals. Although the species is very